Windows 2003

HP StorageWorks MSA Hardware Providers administration guide

MSA1000

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first edition (February 2005)

part number: T1634-96070

This guide explains how to install and administer HWP for use with HP MSA disk arrays and Windows Server 2003.

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About this guide

This guide provides information about installing the HP StorageWorks Hardware Providers (HWP) product on HP StorageWorks disk arrays. Disk array models covered are indicated on the front cover.

Intended audience

The instructions in this guide are intended for system administrators who have the following skills and knowledge:

- Familiarity with the MSA family of disk arrays and LUN configuration
- Familiarity with MSA array software
- Expertise with the Windows 2003 operating system and its file system

For more information about HP StorageWorks MSA products, contact your HP account representative, or visit HP online:

http://www.hp.com.

Disk arrays

Unless otherwise noted, the term *disk array* refers to the MSA disk arrays listed on the front cover of this guide.

Related documentation

HP provides the following related documentation:

- *HP StorageWorks Modular Smart Array: Installation Guide*
- *HP StorageWorks Modular Smart Array: Reference Guide*
- *HP StorageWorks Modular Smart Array: User Guide*
- *HP StorageWorks Modular Smart Array: Configuration Utility User Guide*

For information about Windows software, operating system commands, and third-party products, refer to the manufacturer's documentation.

Getting help

If you have questions after reading this guide, contact an HP authorized service provider or access our website:

www.hp.com

HP storage website

The HP storage website has the latest information about this product, as well as the latest drivers. Select the appropriate product or solution from this website:

thenew.hp.com/country/us/eng/prodserv/storage.html

HP technical support

Telephone numbers for worldwide technical support are on the HP website:

thenew.hp.com/country/us/eng/support.html

From this website, select the country of origin.

Be sure to have the following information available before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed questions

For continuous quality improvement, calls may be recorded or monitored.

HP authorized reseller

You can obtain the name of your nearest HP authorized reseller by telephone:

United States	1-800-345-1518
Canada	1-800-263-5868
elsewhere	See the HP website for locations and telephone numbers: www.hp.com

Conventions

This guide uses the following text conventions.

page 1	Blue text represents a cross-reference. For the online version of this guide, the reference is linked to the target.
www.hp.com	Underlined, blue text represents a website on the Internet. For the online version of this guide, the reference is linked to the target.
literal	Bold text represents literal values that you type exactly as shown, as well as key and field names, menu items, buttons, file names, application names, and dialog box titles.
variable	Italics indicates that you must supply a value. Italics is also used for manual titles.
`input/output`	Monospace font denotes user input and system responses, such as output and messages.
Example	Denotes an example of input or output. The display shown in this guide may not match your configuration exactly.
[ ]	Indicates an optional parameter.
{ }	Indicates that you must specify at least one of the listed options.
|	Separates alternatives in a list of options.

Revision history

February 2005	New manual for MSA disk arrays.

Warranty statement

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1

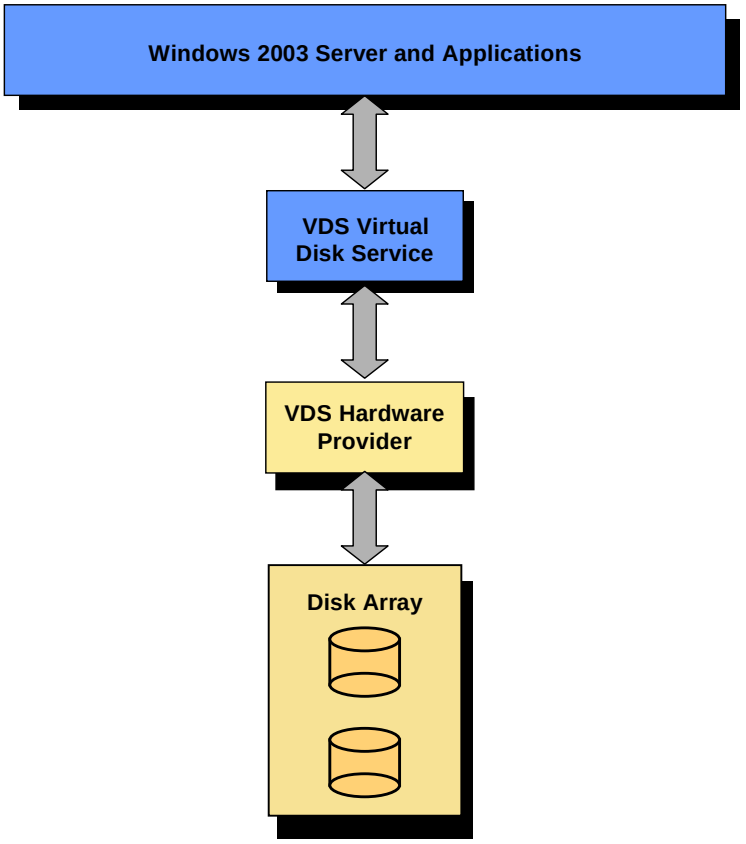
Overview

This chapter describes the HP StorageWorks Hardware Providers (HWP) for Windows 2003 and explains how they operate with Microsoft's operating system and applications.

When you have read this chapter, you should have a functional understanding of the Hardware Providers that will prepare you to install the providers and get them working.

Simple overview

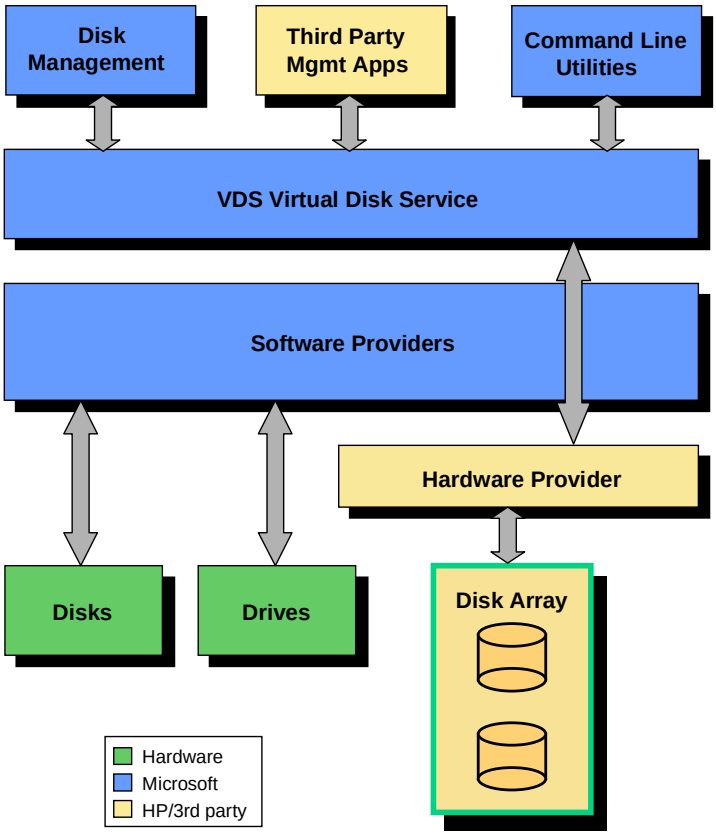
The HP StorageWorks VDS Hardware Provider (HWP) for Windows 2003 is a solution that installs on a Windows 2003 server connected to an HP disk array. The HP VDS Hardware Provider works with the Microsoft Virtual Disk Service (VDS) to enable the Windows OS and applications to manage the MSA disk array.



Detailed overview

The HP VDS Hardware Provider expands on the capability of Windows and Windows applications to manage the HP disk array.

Through the HP VDS HWP, Windows and Windows applications can perform disk array LUN and port management tasks normally performed using proprietary array control software.



Functional components

The process of managing array volumes using VDS and HWP involves the following components:

- Microsoft Windows 2003 OS (with Active Directory service)
- Windows Disk Management
- Third Party Management Applications
- Microsoft Command Line Utilities
- Windows Software Providers
- Windows Virtual Disk Service
- HP VDS Hardware Provider
- HP Disk Array System

The following pages describe each component of the preceding illustration.

Microsoft Windows 2003 operating system

HP Hardware Provider and Microsoft's VDS service work under the control of the Windows Server 2003 operating system. The Windows OS operates the servers to which the disk array is attached and supports the applications, services, and providers that store and retrieve data on the array and manage array disks and volumes.

Windows Disk Management

Windows Disk Management consists of the Windows software and user interfaces that enable you to manage disks, volumes, and file systems. The user interface for disk management is included in the Computer Management application within the Administrative Tools Control Panel.

Third party management applications

Third party management applications control the Microsoft VDS service to manage array disks and volumes.

Microsoft command line interfaces

Microsoft offers two command line utilities: DiskPart and DiskRaid. These interfaces enable you to script disk management tasks so you can automate configuration of multiple storage disks.

The DiskPart utility, which comes standard with Windows XP and Windows Server 2003, manages disks, volumes, and partitions. Using DiskPart, you can use the command line to manage the disk array.

The DiskRaid utility, which comes with the Windows 2003 Server Resource Kit, configures hardware RAID storage systems. It works with any storage hardware that includes a VDS hardware provider, including HP arrays using the HP VDS HWP. DiskRaid has a command syntax similar to DiskPart.

Windows software providers

The Microsoft software providers (called Basic Disk Provider and Dynamic Disk Provider) interface between the Windows OS, Windows applications, and disks, drives, and disk arrays. Through these Software Providers and VDS, Windows sees the disks, drives, and disk array volumes and performs actions such as partitioning, mounting, and managing the file system.

HP Hardware Providers are not required in order for the Microsoft or third party software providers to perform the tasks described above on the HP disk arrays. However, the HP HWPs extend the capabilities of various Windows providers and applications to do additional LUN and port management tasks that normally require the HP array management software.

Microsoft Virtual Disk Service (VDS)

Microsoft VDS provides an interface for managing volumes and logical units. Administrators can identify, configure, and monitor supported HP disk array volumes from the Windows Server 2003 Microsoft Management Console (MMC).

- Provides the capability of Windows and Windows applications to recognize the HP disk array and perform basic and dynamic disk management functions.
- Microsoft Management Console (MMC) Snap-in, Disk Manager and DiskPart command line interface use the VDS service.
- When used with HP VDS HWP, Windows and Windows applications can perform disk array LUN and port management tasks normally performed using proprietary array control software.

VDS manages the HP disk array to make it appear like a Windows disk for Windows applications. When you use Microsoft Management Console, Windows Disk Manager and the Microsoft DiskPart or DiskRaid utility to control the array, your commands are sent to the array through VDS and the software or hardware providers.

VDS performs the following functions:

- Coordinates all providers and clients (local and remote)
- Performs binding
- Discloses hardware LUNs to software disks
- Performs common file system functions
- Monitors volume status
- Includes an API layer

HP VDS Hardware Provider

The HP Hardware Provider for VDS consists of special HP DLLs and executables that install on the Windows server. These components extend the capability of Windows and Windows applications to communicate with and manage the disk array.

Hardware Providers typical applications

The advantage of VDS and the HP VDS HWP is that they allow you to manage the HP disk array using the Windows interface. Array management tasks that would normally require the array's proprietary management application can be done using VDS and the third party Windows management application of your choice. When you have multiple array models, this is particularly helpful because you can manage all arrays from a single interface. Windows applications can manage the arrays to manage ports, discover and manage LUNs, format, partition, and mount volumes, create and manage file systems and files. One Windows application can be used for storing and managing data on multiple array models as well as other storage devices.

HP disk array

Specific HP VDS Hardware Providers have been created to work with selected models of the HP disk arrays. Different supporting technologies and features within the arrays result in some differences in their methods and capabilities of performing VDS tasks.

2

Configuration

This chapter lists required hardware and software components and explains how to configure the disk array and Windows 2003 servers for use with HWP. You must complete the procedures in this chapter before you install HWP.

IMPORTANT NOTE: The right combination of software versions is crucial to configuring a working system. Refer to the *HP StorageWorks Hardware Providers Supported Configurations* document and any README files accompanying the HP HWP installation files for information about compatible software versions and system configurations.

For HP Hardware Providers documentation and software downloads, see the following web location:

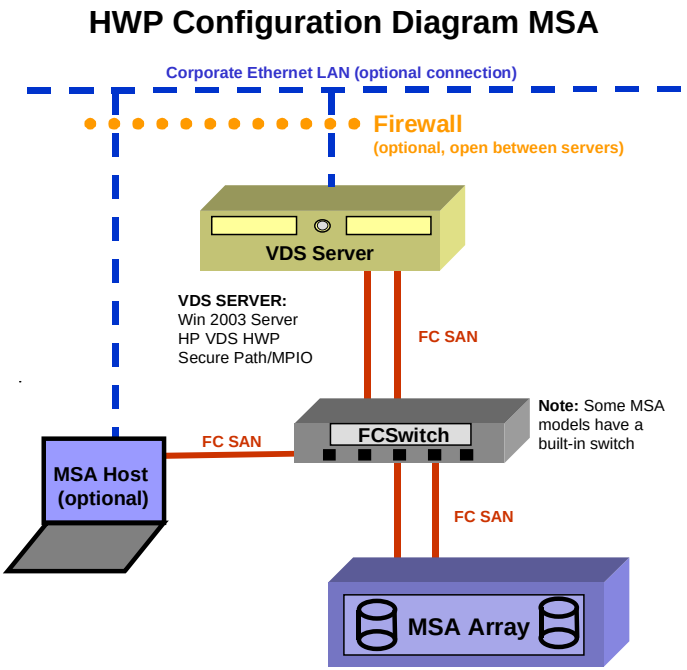
www.hp.com/support/vssvdshwp

Required components

The following hardware and software components are required in order to use HP VDS HWP with an HP MSA disk array.

Required hardware components

- **HP StorageWorks MSA Disk Array** (MSA Host recommended but not required for VDS HWP)
- **Windows 2003 Server:** This server will contain the Microsoft VDS Service and HP VDS Hardware Provider.
- **Fibre Channel Host bus adapter (HBA):** To install in the VDS HWP server to provide FC connection to the MSA array.
- **Fibre Channel switch and cabling:** For connecting the VDS HWP server to the array via fabric SAN. Some arrays have a built-in switch.



Required software components

IMPORTANT NOTE: The right combination of software versions is crucial to configuring a working system. Refer to the *HP StorageWorks Hardware Providers Supported Configurations* document and any README files accompanying the HP HWP installation files for information about compatible software versions and system configurations. Follow all configuration and installation instructions carefully.

The following software is required to run HP VDS HWP.

HP StorageWorks MSA disk array (host server optional for HWP)**:**

- Fully configured array
- HP Secure Path or MPIO multipath software license

Windows VDS HWP server:

- Windows 2003 Server
- HP VDS HWP
- HP Secure Path or MPIO software
- Microsoft QFEs (quick fixes), if required for your OS or VDS, are listed in the HP HWP README file. Search the Microsoft website for "quick fixes" and download them.

Configuration procedures

Physically install and configure the disk array and the server as described below and in the manuals for those products. Refer to the diagram on page 22 for an overview of interconnections.

Configuration summary

You will perform the following tasks during configuration:

VDS HWP Windows 2003 server:

- Install Windows 2003 Server OS.
- Install FC Host Bus Adapter and driver and connect to the array.
- Install NIC card and connect to Ethernet LAN (optional).
- Install HP Secure Path or MPIO software.

Disk array and host:

- Connect the array to the VDS Server through the FC switch.
- Verify existing or install Secure Path or MPIO software license.

Important configuration note:

Administrator privileges are required for all devices and software. If you do not have administrator privileges, the software and hardware will not communicate properly.

Configuring the VDS HWP server

Install and configure the Windows 2003 server that will run the HP VDS HWP software as follows:

1. If it is not already present, install the Windows 2003 Server OS on the server that will run the HP VDS HWP software.
2. Install a Fibre Channel host bus adapter (HBA) card into the server according to the HBA manufacturer's instructions.
3. Connect the server to the disk array via the built-in Fibre Channel fabric switch, if present, or an external switch. Configure the switch according to the manufacturer's instructions.
4. Install the HBA driver and utility software onto the server according to the HBA manufacturer's instructions. HP tested drivers are available by searching hp.com; follow the README file that comes with the driver for installation. For a list of HP approved HWP HBAs and drivers, see the HP VDS HWP README file.
5. If desired, connect the server to the corporate Ethernet LAN (optional). A firewall is recommended but optional.
6. Install Secure Path MSA or MPIO software on the VDS HWP server according to the *Secure Path* or *MPIO Installation Guide*.
7. Complete the rest of configuration in this chapter and then install the required HP VDS HWP software on the server as explained in Chapter 3 "Installation."

Configuring the disk array and host

Ensure the disk array and host have been fully installed and configured, including installing the ACU software on the host. For details, refer to the *HP Array Configuration Utility User Guide*. The following steps summarize the configuration requirements for the array to work with the VDS HWP server:

1. Ensure the array is connected to the VDS HWP server via the built-in Fibre Channel switch (on some MSA models) or an external switch.
2. If desired, connect the array host to the corporate Ethernet LAN (optional). A firewall is optional but recommended.
3. If it is not already present, install Secure Path MSA or MPIO software on the array host according to the *Secure Path* or *MPIO Installation Guide*.

3

Installation

This chapter explains how to install Hardware Providers (HWP) and other required software. When you install HWP, the extended storage management features of VDS are enabled.

IMPORTANT NOTE: The right combination of software versions is crucial to configuring a working system. Refer to the *HP StorageWorks Hardware Providers Supported Configurations* document and any README files accompanying the HP HWP installation files for information about compatible software versions and system configurations.

For HP Hardware Providers documentation and software downloads, see the following web location:

www.hp.com/support/vssvdshwp

Installation procedures

The following procedures describe how to install the Hardware Providers on a Windows 2003 server.

If you have not already configured the server and the array as instructed in Chapter 2 Configuration, do so now before you install the HWP software. HWP will not work if the array and server have not been correctly configured before you install HWP.

Installation summary

You will perform the following tasks on the Windows server during installation:

- Run the HWP installation executable:
  hp StorageWorks VDS hardware provider for MSA.msi.
- Follow the InstallShield Wizard instructions to install the software.
- Install Microsoft QFEs (quick fixes), if any. See the HWP **README**.
- Verify installation using Windows Disk Management and DiskRaid.

Installing HWP

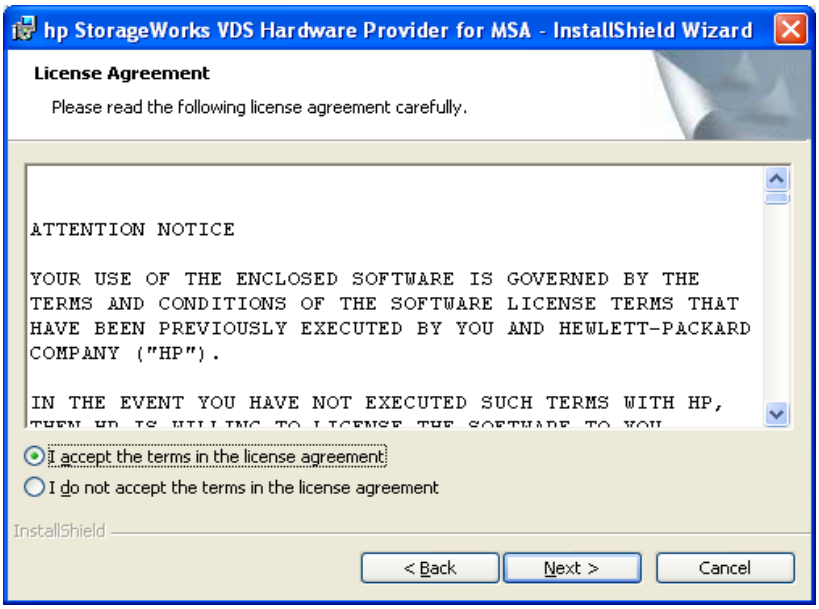
Follow these steps to install the HP VDS Hardware Provider on a Windows 2003 server:

1. Insert the HWP installation CD and double click the HWP executable:

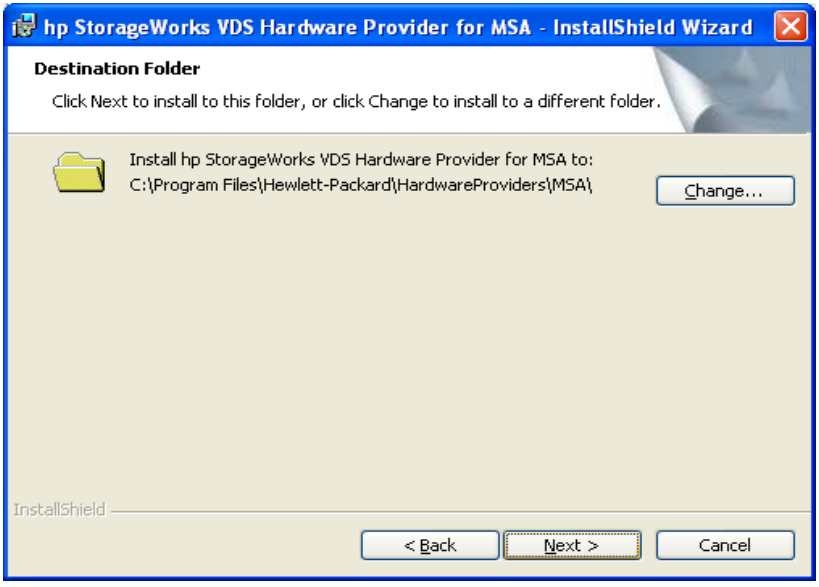
   hp StorageWorks VDS hardware provider for MSA.msi

   The InstallShield Welcome window appears.

2. Click **Next**. The License Agreement window appears.

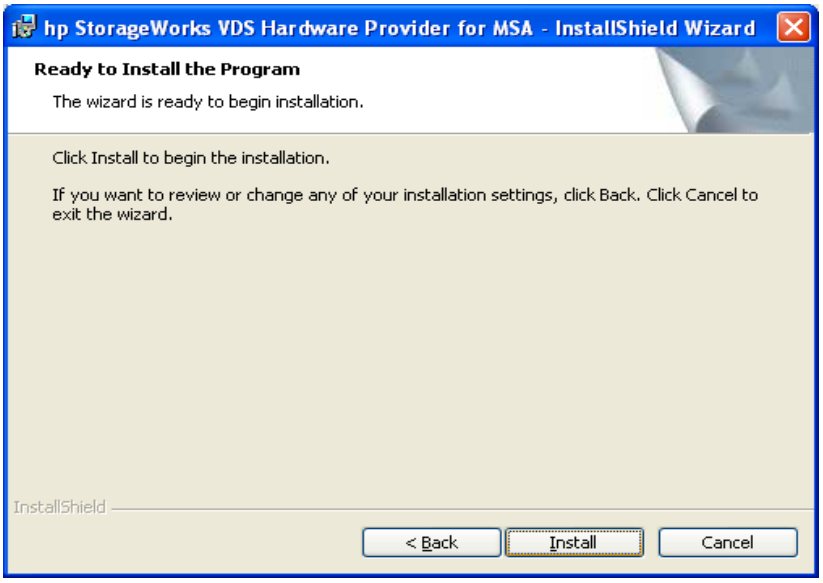


3. Click **"I accept..."** to agree to the license terms, and click **Next**. The Destination Folder window appears.

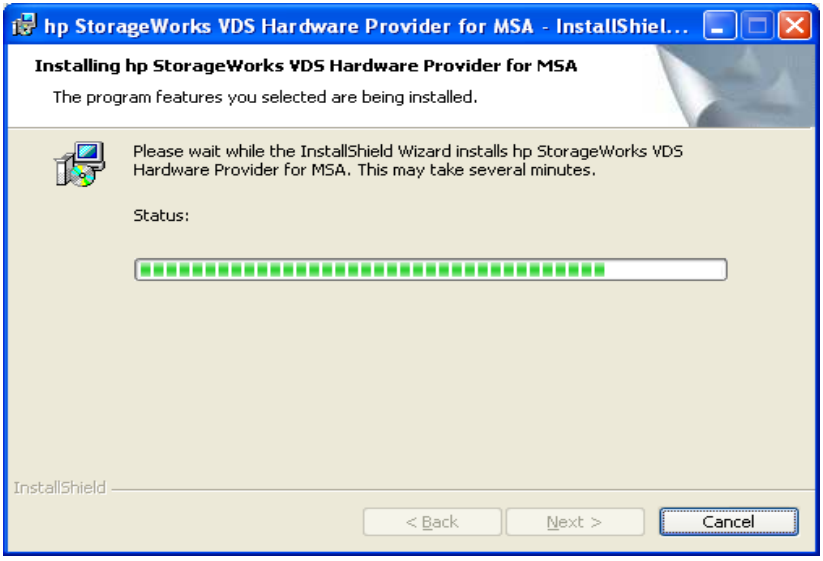


4. Click **Next** to install VDS in the default location, or click **Change** to browse for a new location, and then click **Next**.

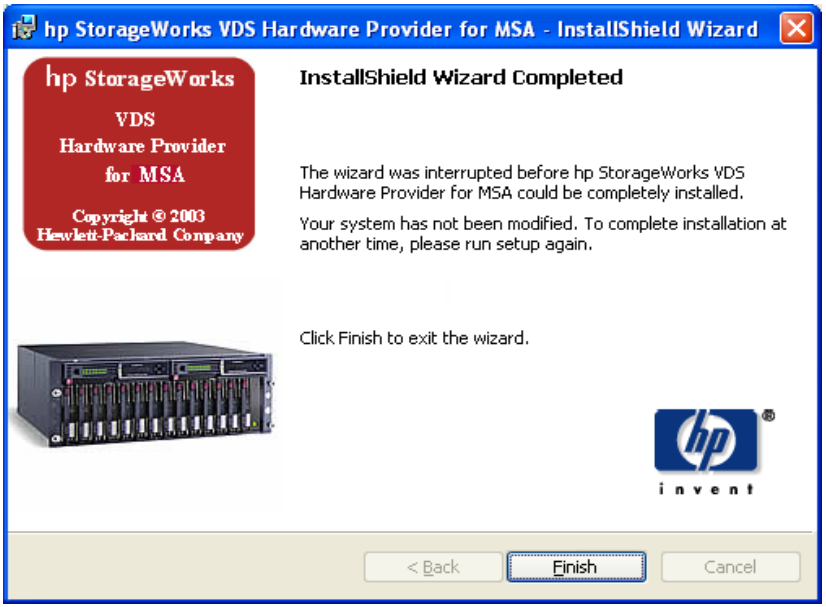
   The Ready to Install window appears.



5. Click **Install** to start the installation process. A status window appears to show progress.



6. When installation finishes, the InstallShield Wizard Completed window appears.



7. Click **Finish**. HP VDS HWP installation is complete. If all other applications have been installed, this is a good time to install the Microsoft QFEs (quick fixes) from the Microsoft website. The QFEs are required to fix problems in the Microsoft OS that have not yet been released in a service pack. For information about QFEs that are currently needed for HWP, see the HWP **README** file.

Verifying installation

To verify installation, perform the following tests. If you have any trouble with installation or with verifying installation, see Chapter 4 “Troubleshooting” in this guide.

Checking visibility of the disk array

If you configured the disk array and server properly, the array LUNs should be visible in the Disk Management window on the VDS server. Click the Windows **Start** menu, click **Administrative Tools**, click **Computer Management** and click **Disk Management**. You should see the array LUNs listed.

Checking the list of programs in Windows

A simple way to verify successful installation of the HP VDS HWP is to make sure it is listed in the Add/Remove Programs Control Panel in Windows. To see the list of installed programs, click Windows **Start**, click **Settings**, click **Control Panel**, and double-click **Add/Remove Programs**. Verify the HP VDS HWP appears in the list of installed programs.

Checking VDS disk management using DiskRaid

The Microsoft DiskRaid command line interface uses the HP VDS HWP in order to perform certain tasks on the HP disk array. You can install and run DiskRaid and use the “list provider” and “list subsystem” commands to verify the HP VDS HWP is working. The example output below shows the use of these commands:

```
DISKRAID> List Provider

  Prov ###  Name                                          Version
  --------  --------------------------------------------  ----------
* Prov 0    hpMSA VDS Hardware Provider                 2.7.2.0

DISKRAID> list subsystem

  Subsys ###  Name                           Status      Health
  ----------  -----------------------------  ----------  ----------
  Subsys 0    HP MSA 1000 (SN 12345)         Online      Healthy
```

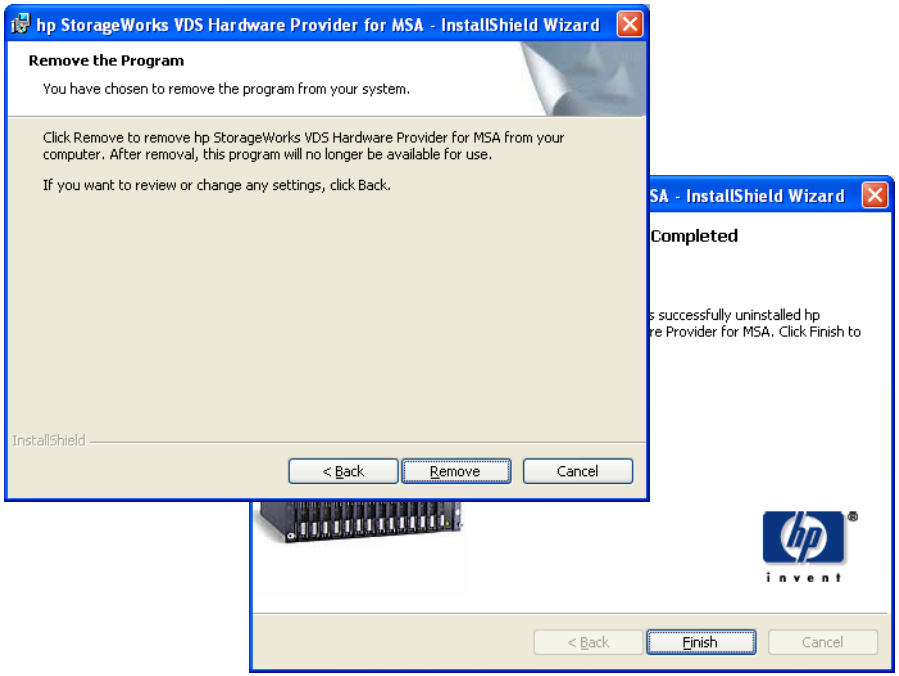
Uninstalling HWP

Uninstalling HWP using Windows

1. In Windows, select **Start > Settings > Control Panel**.
2. Double-click **Add/Remove Programs**.
3. Select the VDS HWP program for removal.
4. Click **Change/Remove**. Windows removes the program.

Uninstalling using HWP installer

You can also uninstall HWP by starting the HWP installer again. Click the **Remove** button and then click Finish when removal has been completed.



4

Troubleshooting

This chapter explains how to troubleshoot the HP VDS Hardware Provider (HWP) and includes a list of error messages and explanations.

Troubleshooting

The following instructions present typical problems and solutions.

VDS will not install

The HP VDS HWP installation works only on the Windows versions listed in the README file supplied with the HP HWP. The installer will not install the software on other versions of Windows.

Cannot manage the array using HWP

Use a process of elimination to determine whether the problem is with one of the following components:

- Application you are using to manage the array
- Windows Disk Management configuration
- VDS
- HP VDS HWP

Perform these tests:

1. Do the array volumes appear in the Disk Management tool? To check, in the Windows menu bar select **Start > Control Panels > Administrative Tools > Computer Management > Storage > Disk Management**. If LUNs are visible, Disk Management, VDS, and the array are communicating successfully, and any problems may be caused by a configuration problem with the management application or HWP. If array LUNs are not visible, click **Action > Refresh** and **Action > Scan Disks**. If LUNs are not visible, the problem could be connectivity or configuration of any or all of the components listed above.
2. Use the DiskPart utility to check for the presence of array volumes. At the Run command line, type **diskpart.exe**. Then type **list volume** to see a list of volumes. (Type "help" to see a list of commands.) If array volumes are listed, DiskPart, the array and VDS are communicating successfully. Any problem with operation could be caused by

configuration of Windows Disk Management, the management application, or HWP. If LUNs are not visible, there may be a problem with connectivity or with configuration of the array or HP VDS HWP.

If you receive this error message: "**The disk management services could not complete the operation**," VDS is not enabled at startup. Click **Start > Control Panels > Administrative Tools > Services > right-click Virtual Disk Service > Properties > click Manual under Startup type and click OK**.

3. Check the README file that came with your HP HWP installation files to verify you are using compatible versions of software.
4. Check configuration as explained in Chapter 2 Configuration:
   - Check connectivity between the array and the server.
   - Make sure you logged into all devices and software using administrator privileges.
5. Visit the Microsoft website support knowledge base and search for "VDS logging." Turn on logging as instructed by Microsoft and use the Microsoft procedure for testing VDS and checking the log.

VDS error messages

The following table lists VDS error messages and their meanings.

Message Id	MessageID Value (hex)	Message Text
VDS_E_NOT_SUPPORTED	0x80042400L	The operation is not supported by the object.
VDS_E_INITIALIZED_FAILED	0x80042401L	The service failed to initialize.
VDS_E_INITIALIZE_NOT_CALLED	0x80042402L	The initialization method is not called.
VDS_E_ALREADY_REGISTERED	0x80042403L	The provider is already registered.
VDS_E_ANOTHER_CALL_IN_PROGRESS	0x80042404L	A concurrent second call is made on an object before the first is completed.
VDS_E_OBJECT_NOT_FOUND	0x80042405L	The object is not found.
VDS_E_INVALID_SPACE	0x80042406L	The specified space is not free or not valid.
VDS_E_PARTITION_LIMIT_REACHED	0x80042407L	Number of partitions has reached the limit on a disk.
VDS_E_PARTITION_NOT_EMPTY	0x80042408L	The extended partition is not empty.
VDS_E_OPERATION_PENDING	0x80042409L	The operation has not been completed yet.
VDS_E_OPERATION_DENIED	0x8004240AL	This operation is not allowed on the current boot, system or page file volume.
VDS_E_OBJECT_DELETED	0x8004240BL	The object has been deleted.
VDS_E_CANCEL_TOO_LATE	0x8004240CL	The operation cannot be cancelled because it is too late.
VDS_E_OPERATION_CANCELED	0x8004240DL	The operation has been cancelled.
VDS_E_CANNOT_EXTEND	0x8004240EL	The volume cannot be extended because the file system does not support it.
VDS_E_NOT_ENOUGH_SPACE	0x8004240FL	There is not enough usable space for this operation.
VDS_E_NOT_ENOUGH_DRIVE	0x80042410L	Not enough drives are specified to complete this operation.

VDS_E_BAD_COOKIE	0x80042411L	The cookie is not found.
VDS_E_NO_MEDIA	0x80042412L	There is no media in the device.
VDS_E_DEVICE_IN_USE	0x80042413L	The device is in use.
VDS_E_DISK_NOT_EMPTY	0x80042414L	The disk is not empty.
VDS_E_INVALID_OPERATION	0x80042415L	Invalid operation.
VDS_E_PATH_NOT_FOUND	0x80042416L	The path is not found.
VDS_E_DISK_NOT_INITIALIZED	0x80042417L	The disk is not initialized.
VDS_E_NOT_AN_UNALLOCATED_DISK	0x80042418L	The disk is not unallocated.
VDS_E_UNRECOVERABLE_ERROR	0x80042419L	Unrecoverable error happened. The service must shut down.
VDS_S_DISK_PARTIALLY_CLEANED	0x0004241AL	The disk is not fully cleaned due to I/O error.
VDS_E_DMADMIN_SERVICE_ CONNECTION_FAILED	0x8004241BL	The provider failed to connect to the Logical Disk Management Administrative service.
VDS_E_PROVIDER_INITIALIZATION_ FAILED	0x8004241CL	The provider failed to initialize.
VDS_E_OBJECT_EXISTS	0x8004241DL	The object already exists.
VDS_E_NO_DISKS_FOUND	0x8004241EL	No disks were found on the target machine.
VDS_E_PROVIDER_CACHE_CORRUPT	0x8004241FL	The provider's cache has become corrupt.
VDS_E_DMADMIN_METHOD_CALL_FAILED	0x80042420L	A method call to the Logical Disk Management Administrative service failed.
VDS_S_PROVIDER_ERROR_LOADING_CACHE	0x00042421L	The provider encountered errors while loading the cache. See the NT Event Log for more information.
VDS_E_PROVIDER_VOL_DEVICE_NAME_NOT_ FOUND	0x80042422L	The device form of the volume pathname could not be retrieved.
VDS_E_PROVIDER_VOL_OPEN	0x80042423L	Failed to open the volume device.
VDS_E_DMADMIN_CORRUPT_NOTIFICATION	0x80042424L	A corrupt notification was sent from the Logical Disk Manager Administrative service.
VDS_E_INCOMPATIBLE_FILE_SYSTEM	0x80042425L	The file system is incompatible.
VDS_E_INCOMPATIBLE_MEDIA	0x80042426L	The media is incompatible.

VDS_E_ACCESS_DENIED	0x80042427L	Access is denied.
VDS_E_MEDIA_WRITE_PROTECTED	0x80042428L	The media is write protected.
HRESULT VDS_E_BAD_LABEL	0x80042429L	The label is illegal.
VDS_E_CANT_QUICK_FORMAT	0x8004242AL	Can not quick format the volume.
VDS_E_IO_ERROR	0x8004242BL	IO error occurred during format.
VDS_E_VOLUME_TOO_SMALL	0x8004242CL	The volume size is too small.
VDS_E_VOLUME_TOO_BIG	0x8004242DL	The volume size is too big.
VDS_E_CLUSTER_SIZE_TOO_SMALL	0x8004242EL	The cluster size is too small.
VDS_E_CLUSTER_SIZE_TOO_BIG	0x8004242FL	The cluster size is too big.
VDS_E_CLUSTER_COUNT_BEYOND_32BITS	0x80042430L	The number of clusters is too big for 32 bit integer.
VDS_E_OBJECT_STATUS_	0x80042431L	The object is in failed status.
VDS_E_VOLUME_INCOMPLETE	0x80042432L	All extents for the volume could not be found.
VDS_E_EXTENT_SIZE_LESS_THAN_MIN	0x80042433L	The size of the extent is less than the minimum.
VDS_S_UPDATE_BOOTFILE_FAILED	0x00042434L	Failed to update the boot.ini file or NVRAM.
VDS_S_BOOT_PARTITION_NUMBER_CHANGE	0x00042436L	The boot partition's partition number will change as a result of the migration operation.
VDS_E_BOOT_PARTITION_NUMBER_CHANGE	0x80042436L	The migration operation failed. The boot partition's partition number will change as a result of the migration operation.
VDS_E_NO_FREE_SPACE	0x80042437L	The migration operation failed. The selected disk does not have enough free space to complete the operation.
VDS_E_ACTIVE_PARTITION	0x80042438L	The migration operation failed. An active partition was detected on the selected disk, and it is not the active partition used to boot the currently running OS.
VDS_E_PARTITION_OF_UNKNOWN_TYPE	0x80042439L	The migration operation failed. Cannot read partition information.

VDS_E_LEGACY_VOLUME_FORMAT	0x8004243AL	The migration operation failed. A partition with an unknown type was detected on the selected disk.
VDS_E_NON_CONTIGUOUS_DATA_ PARTITIONS	0x8004243BL	The migration operation failed. The selected GPT formatted disk contains a non-basic-data partition, which is both preceded, and followed, by a basic data partition(s).
VDS_E_MIGRATE_OPEN_VOLUME	0x8004243CL	The migration operation failed. A volume on the selected disk could not be opened.
VDS_E_VOLUME_NOT_ONLINE	0x8004243DL	Operation failed. The volume is not online
VDS_E_VOLUME_NOT_HEALTHY	0x8004243EL	Operation failed. The volume is not healthy.
VDS_E_VOLUME_SPANS_DISKS	0x8004243FL	Operation failed. The volume spans multiple disks.
VDS_E_REQUIRES_CONTIGUOUS_DISK_SPACE	0x80042440L	Operation failed. The volume consists of multiple extents.
VDS_E_BAD_PROVIDER_DATA	0x80042441L	A provider returned bad data.
VDS_E_PROVIDER_FAILURE	0x80042442L	A provider failed to complete an operation.
VDS_S_VOLUME_COMPRESS_FAILED	0x00042443L	Failed to compress the volume.
VDS_E_PACK_OFFLINE	0x80042444L	The operation failed. The pack is not online.
VDS_E_VOLUME_NOT_A_MIRROR	0x80042445L	Break or remove plex operation failed. The volume is not a mirror.
VDS_E_NO_EXTENTS_FOR_VOLUME	0x80042446L	No extents were found for the volume.
VDS_E_DISK_NOT_LOADED_TO_CACHE	0x80042447L	The migrated disk failed to load to the cache.
VDS_E_INTERNAL_ERROR	0x80042448L	Check the event log for errors.
VDS_S_ACCESS_PATH_NOT_DELETED	0x000042449L	The access paths on the volume may not be deleted.
VDS_E_PROVIDER_TYPE_NOT_SUPPORTED	0x8004244AL	The method call is not supported for the specified provider type.
VDS_E_DISK_NOT_ONLINE	0x8004244BL	The repair operation failed. The disk is already in use by the volume.
VDS_S_IN_PROGRESS	0x0004244DL	The asynchronous operation is in progress.
VDS_E_ASYNC_OBJECT_FAILURE	0x8004244EL	Failure initializing the asynchronous object.

VDS_E_VOLUME_NOT_MOUNTED	0x8004244FL	The volume is not mounted.
VDS_E_PACK_NOT_FOUND	0x80042450L	The pack was not found.
VDS_E_IMPORT_SET_INCOMPLETE	0x80042451L	Import failed. Attempt to import a subset of the disks in the foreign pack.
VDS_E_DISK_NOT_IMPORTED	0x80042452L	A disk in the import's source pack was not imported.
VDS_E_OBJECT_OUT_OF_SYNC	0x80042453L	The system's information about the object may not be up to date.
VDS_E_MISSING_	0x80042454L	Operation failed. The disk is missing.
VDS_E_DISK_PNP_REG_CORRUPT	0x80042455L	The provider's list of Pnp registered disks has become corrupt.
VDS_E_LBN_REMAP_ENABLED_FLAG	0x80042456L	The provider does not support the LBN REMAP ENABLED volume flag.
VDS_E_NO_DRIVELETTER_FLAG	0x80042457L	The provider does not support the NO DRIVELETTER volume flag.
VDS_E_REVERT_ON_CLOSE	0x80042458L	REVERT ON CLOSE should only be set if the HIDDEN or READ ONLY volume flag is set.
VDS_E_REVERT_ON_CLOSE_SET	0x80042459L	A REVERT ON CLOSE volume flag is already set for this volume.
VDS_E_REVERT_ON_CLOSE_MISMATCH	0x80042459L	When clearing volume flags that have been set using revert on close, the same combination of HIDDEN and/or READ ONLY flags must be passed to both the SetFlags and ClearFlags calls.
VDS_E_IA64_BOOT_MIRRORED_TO_MBR	0x8004245AL	Not Used! You have mirrored your boot volume on a GPT disk, to an MBR disk. You will not be able to boot your machine from the secondary plex.
VDS_S_IA64_BOOT_MIRRORED_TO_MBR	0x0004245AL	You have mirrored your boot volume on a GPT disk, to an MBR disk. You will not be able to boot your machine from the secondary plex.
VDS_S_UNABLE_TO_GET_GPT_ATTRIBUTES	0x0004245BL	Unable to retrieve the GPT attributes for this volume, (hidden, read only and no drive letter).

VDS_E_VOLUME_TEMPORARILY_ DISMOUNTED	0x8004245CL	The volume is temporarily dismounted.
VDS_E_VOLUME_PERMANENTLY_ DISMOUNTED	0x8004245DL	The volume is permanently dismounted.
VDS_E_VOLUME_HAS_PATH	0x8004245EL	The volume still has access path to it.
VDS_E_TIMEOUT	0x8004245FL	The operation timed out.
VDS_E_REPAIR_VOLUMESTATE	0x80042460L	The operation could not be completed. To repair a volume, both the volume and plex must be online, and must not be healthy or rebuilding.
VDS_E_LDM_TIMEOUT	0x80042461L	The operation timed out in the Logical Disk Manager Administrative service. Retry the operation.
VDS_E_PLEX_NOT_REGENERATED	0x80042462L	The operation failed. Cannot retain plex that has not regenerated.
VDS_E_RETRY	0x80042463L	The operation failed. Retry the operation.
VDS_E_ONLINE_PACK_EXISTS	0x80042464L	Create pack operation failed. An online pack already exists.

Glossary

This glossary defines acronyms and terms used in this guide or related to this product and is not a comprehensive glossary of computer terms.

API Application Programming Interface, an interface that allows a software application to connect to and work with a third party software application.

clone A full copy of a volume, usable by an application.

CV HP StorageWorks CommandView, a browser-based interface that allows management of an HP disk array.

differential copy A copy of a database consisting only of the differences in the database since the last full copy.

disk array A RAID. A collection of disk drives within a cabinet or multiple cabinets and including a controller and software allowing drives to be ganged together in various configurations to create virtual drives (LUNs).

EVA HP StorageWorks Enterprise Virtual Array.

FC Fibre Channel, a fiber optic interconnection standard commonly used for storage area networks.

GUI Graphical User Interface.

HBA Host bus adapter. The FC interface card that installs in a host to connect the host to a fabric SAN.

HWP	Hardware Providers. A collection of software that executes on the host, a bus adapter, and the disk array to enable managing and/or copying of array LUNs through the Windows OS and applications.
LAN	Local Area Network.
LUN	Logical Unit Number. A physically addressable storage unit as surfaced by a hardware RAID subsystem. A virtual disk, consisting of multiple portions of physical disks addressed as a single unit.
mirror	Synonymous with “clone.”
MSA	HP StorageWorks Modular Smart Array.
plex	A Microsoft term denoting a full copy of data that has been split off from the original and is no longer being updated. Synonymous with “split mirror.”
PVOL	Primary volume. Typically the volume where application data is stored.
RAID	Redundant array of independent disks.
SVOL	Secondary volume. The volume that receives backup copies of data.
SAN fabric	The Fibre Channel hardware and cabling that connects servers to storage devices in a Storage Area Network (SAN) is referred to as a “fabric.” A fabric switch provides automatically-switched connectivity between servers and storage in the fabric.
SNMP	Simple Network Management Protocol.
shadow copy	A Microsoft term describing a point-in-time copy of an original volume. The original volume continues to change as the process continues, but the shadow copy of the volume remains constant.
snapclone	An HP EVA disk array term denoting a full copy of a volume that becomes immediately usable by an application. Created much faster than ordinary clones by taking a snapshot and updating to a full copy in the background.
snapshot	A generic term meaning a static point-in-time copy of a volume, typically used for backup.

split mirror	A full copy of data that has been split off from the original and is no longer being updated.
subsystem	Synonym for “disk array” or “RAID.”
SVP	Service processor. A laptop PC built into the HP XP Disk Array. The SVP provides a direct interface into the disk array, and is used by the HP service representative only.
volume	Generic term for a number of physical disks or portions of disks logically bound together as a virtual disk containing contiguous logical blocks. Volume can also be software shorthand for a mapped volume (Windows drive letter or mount point).
VDS	Microsoft Virtual Disk Service, the Windows service that manages storage through hardware providers.
volume shadow copy	See “shadow copy.”
VSC	Volume Size Configuration, a feature of HP disk arrays that allows creation of logical volumes custom-sized according to user requirements.
VSS	Microsoft Volume Shadow Copy Service, the Windows service that creates data copies. Works through HP HWP to make copies of disk array volumes.
XP	HP StorageWorks XP Disk Array.

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